

[54] **INSULATED ELECTRICAL CONNECTOR**

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[75] Inventor: **John H. Tanges, Jr.**, Ormond Beach, Fla.

*Primary Examiner*—Joseph H. McGlynn  
*Attorney*—Leonard H. King

[73] Assignee: **Florida General Electronics Inc.**, Ormond Beach, Fla.

[22] Filed: **May 4, 1972**

[57] **ABSTRACT**

[21] Appl. No.: **250,445**

An improved electrical connector of the type having a plurality of contacts is provided with means for accurately locating the contact so that the mating connector may be assembled therewith. Simplified means are also provided for improving the internal electrical connections within the connector.

[52] U.S. Cl. .... **339/196 R, 339/207, 339/259 R**

[51] Int. Cl. .... **H01r 13/16**

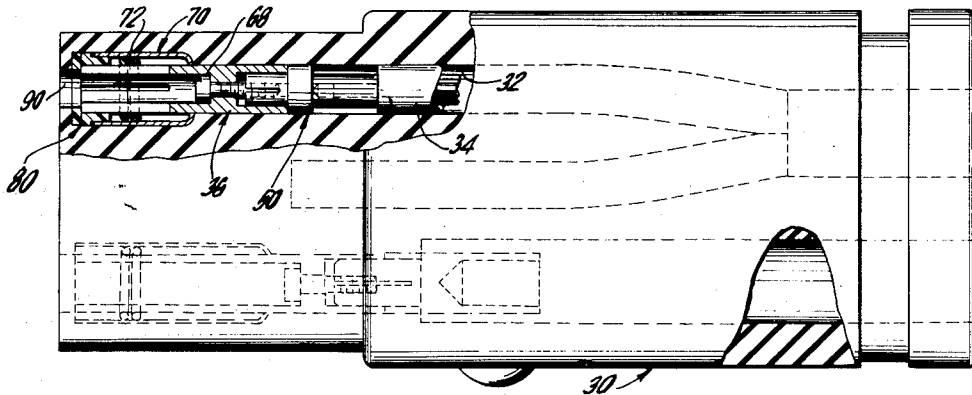
[58] Field of Search..... 339/111, 196, 206, 339/207, 209, 259

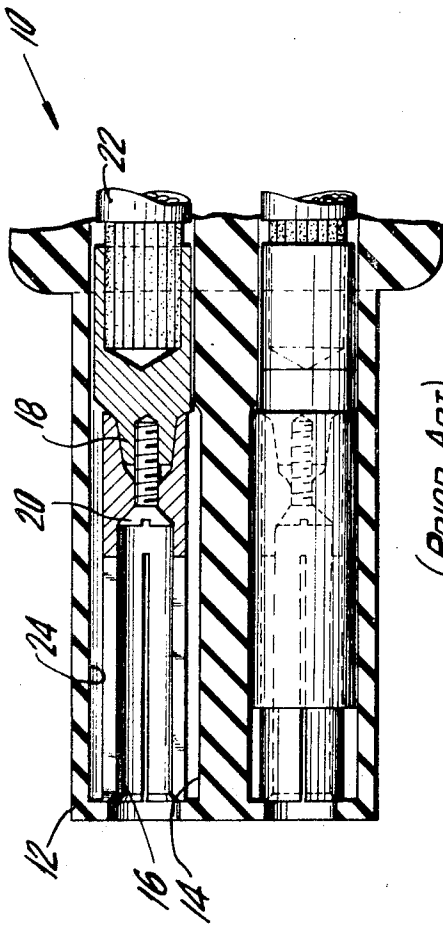
[56] **References Cited**

**UNITED STATES PATENTS**

**2 Claims, 5 Drawing Figures**

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(PRIOR ART)  
FIG. 1

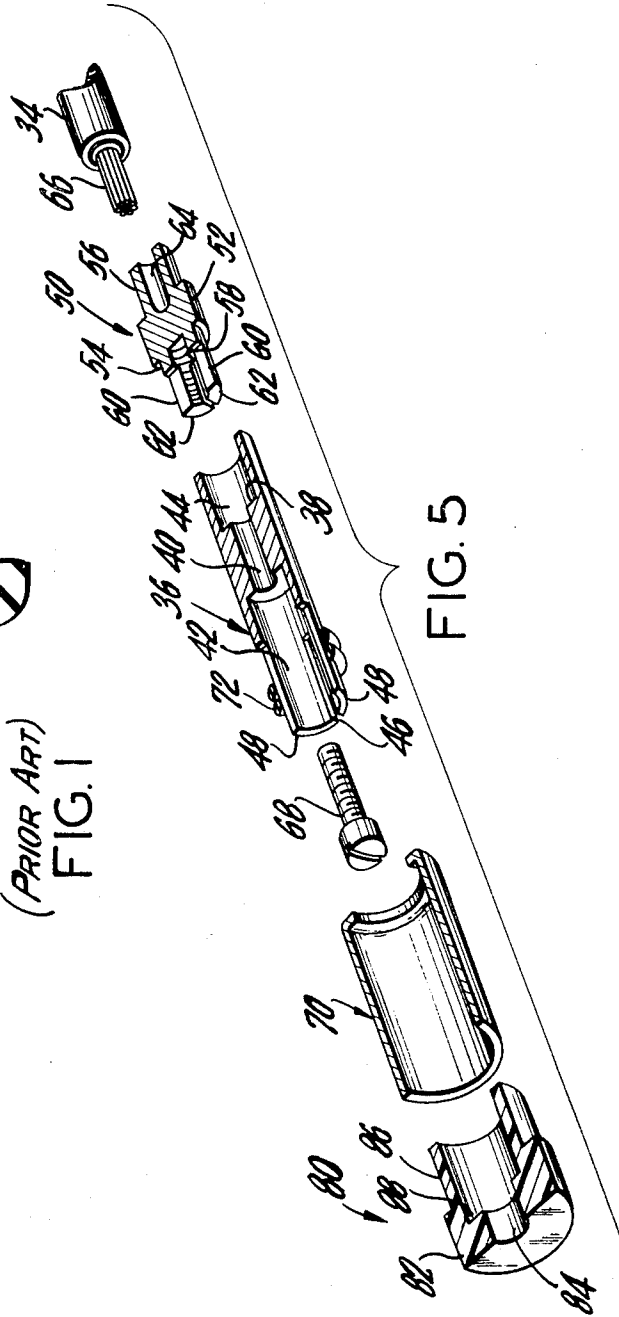


FIG. 5

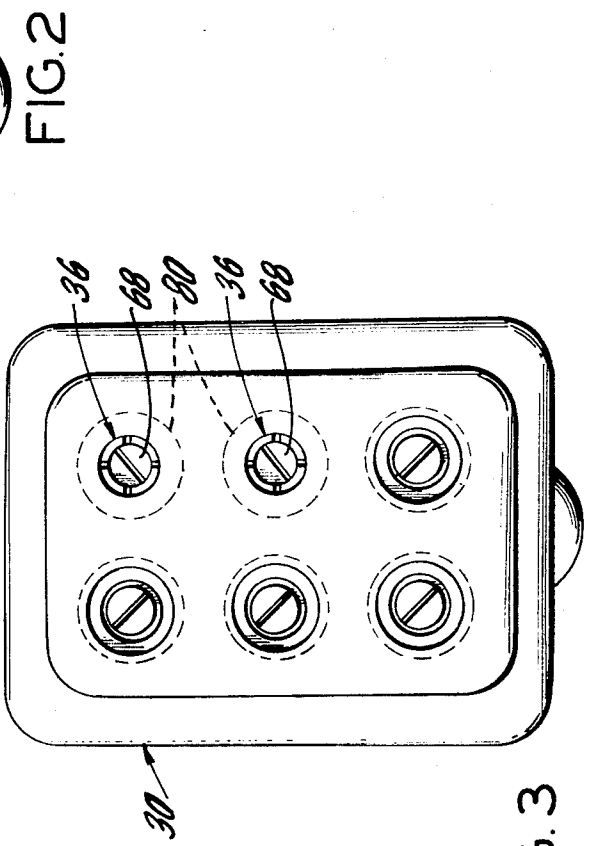
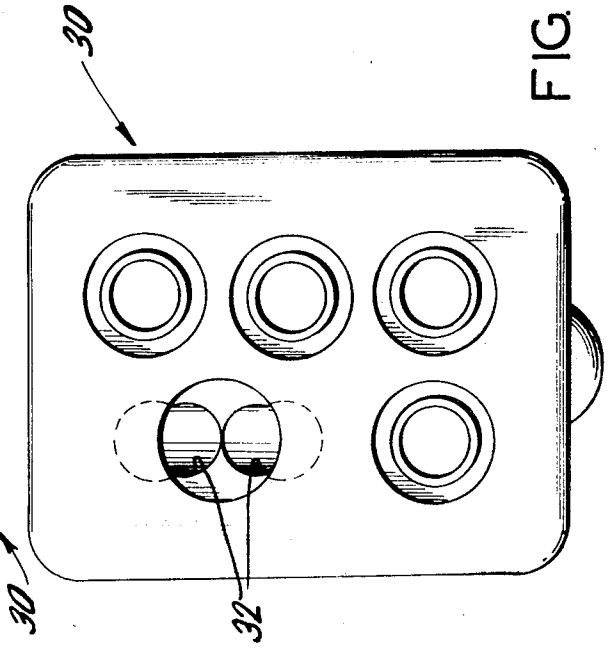
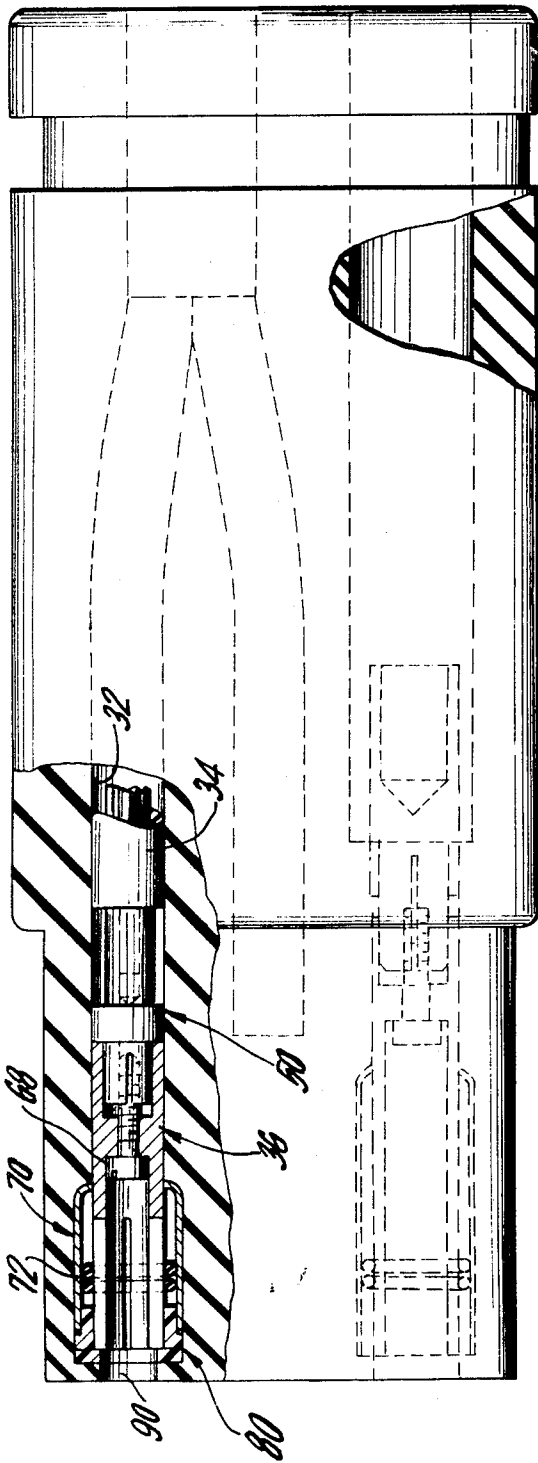


FIG. 4

FIG. 3

**INSULATED ELECTRICAL CONNECTOR**

The aforementioned abstract is neither intended to define the invention of the application which, of course, is measured by the claims, nor is it intended to be limiting as to the scope of the invention in any way. 5

**BACKGROUND OF THE INVENTION****1. Field of the Invention**

This invention relates generally to insulated electrical connectors and, more particularly, to an improved contact locating means therein. 10

**2. Description of the Prior Art**

The prior art in this general field recognized the shortcomings therein but failed to provide solutions to the problems of accurately locating the contacts and providing good electrical connection between the internal components. As regards the first problem, the prior art provided internal sleeves that encircled the contact and which were intended to accurately locate the contact. However, the prior art structure made the assembly of the contact more complex and, therefore, more costly. To provide a secure electrical contact between internal members, the prior art utilized mating tapered members which also served to increase the cost of the components. 15

As may be more fully appreciated from the drawing, the prior art connectors use relatively small bushings that are molded into the rubber body. Thus, the metallic contacts were held in place by a small surface area. As a result, and as conclusively shown by field experience, the contacts of the prior art connectors can be forceably removed or dislocated by pulling on the cable. It has also been found that some prior art connectors have a soft or void area in the center that is an inherent weak point. Not only can this weak point break open in the field and thereby allow moisture to internally damage the connector but it also permits wires to be inserted improperly and thereby cause crossed wires and/or shorts. If the wires short to one another under a load of say 300 - 500 amps, the resulting condition will be hazardous. 20

The present invention, as will be described more fully hereinafter, overcomes the last two mentioned problems found in the prior art structure. For example, the contacts of the present invention are molded such that there are relatively large areas of contact that minimizes the possibility of the contacts being pulled out. The soft area of the prior art is overcome by providing a solid molded plug body that prevents miswiring and wires shorting one to the other. 25

**SUMMARY OF THE INVENTION**

In order to overcome the shortcomings of the prior art, the present invention provides a tubular plastic bushing over the outermost end of the contact. The bushing is located in the housing of the connector adjacent the opening in the housing thereof that is to receive the mating portion of the connector. In order to provide an improved internal electrical connection, the present invention provides a socket within the contact and a lug adapted to be received within the socket. The stripped end of the cable is suitably secured to the lug, such as by soldering, crimping or the like, and then the lug is attached to the connector by means of a screw. The portion of the lug that receives the screw is axially slotted so that when the screw is inserted, the fingers formed by the slots will bear against the inside diameter 30

of the contact and thereby provide an improved electrical connection thereto.

Accordingly, it is an important object of the present invention to provide an improved electrical connector.

It is another object of the present invention to provide an improved electrical connector, as described above, having locating means for the contact thereof.

Still another important object of the present invention is to provide an electrical connector, as described above, having improved means for establishing electrical connection between internal components thereof.

These and other objects, features and advantages of the invention will, in part, be pointed out with particularity and will, in part, become obvious from the following more detailed description of the invention, taken in conjunction with the accompanying drawing, which forms an integral part thereof. 35

**BRIEF DESCRIPTION OF THE DRAWING**

In the various figures of the drawing, like reference characters designate like parts.

FIG. 1 is a fragmentary, elevational view partially in section illustrating structure typical of the prior art;

FIG. 2 is a side elevational view partially in section illustrating a female connector comprising the concept of the present invention; 40

FIG. 3 is an end elevational view of the female electrical connector shown in FIG. 2;

FIG. 4 is another end elevational view opposite to that shown in FIG. 3; and

FIG. 5 is an exploded sectional view illustrating several internal components of the present invention. 45

**DESCRIPTION OF THE PREFERRED EMBODIMENT**

The scope of the present invention may best be understood by first referring to the structure of the prior art. In FIG. 1 there is shown an electrical connector 10 that includes insulator housing 12. Several sockets 14 are formed in housing 12 in order to receive contact means 16. A lug 18 is positioned in each of the sockets 14 in order to be secured to its respective contact by means of a screw 20. The stripped end of cables 22 are inserted in sockets in the lugs 18 and are secured thereto by any suitable means. A tubular sleeve 24 is positioned about the contacts 16 in order to locate them and still provide for some slight movement of the contacts 16 transverse to the axes thereof. 50

The prior art recognized that there was the likelihood of some misalignment between mating contacts in male and female connectors and, therefore, provided for slight lateral movement of the contacts. However, this expedient did not fully overcome the problems in the prior art. As will be described more fully hereinafter, the present invention solves the problem of misalignment, not by permitting lateral movement but, by accurately restraining the contacts. Further, and as clearly shown in FIG. 1, the prior art attempted to provide good electrical contact between the lugs and the contacts by means of mating tapers in these two components. However, as will be readily recognized, the fabrication of tapered elements is more difficult, is more costly than fabricating cylindrical members and does not provide sufficient contact area thus causing arcing under loads of 300 - 500 amps. 55

The construction of the present invention may best be seen by reference to FIG. 1 and to FIG. 5. There is 60

provided an insulating housing 30 in which is formed a plurality of bores 32. Within each bore 32, a contact 36 is located. The contact 36 is metallic and is tubular. A transverse wall 38 having a bore 40 formed there-through is provided in each contact 36 so as to define relatively large tubular chambers 42 and 44 at opposite ends of the contact 36. The chamber 42 is axially slotted, preferably in at least three or four places such as shown by the reference character 46, so as to define a plurality of axially extending fingers 48 between each of the slots 46. A metallic lug generally designated by the reference character 50 is also provided. The lug 50 includes a central, enlarged diameter 52 that is arranged to abut against the end of the chamber 44 in the assembled condition. The enlarged central portion 52 also defines two small diameter ends 54 and 56. Turning first to the end 54, it will be seen that there is provided a central tapped hole 58 therein. In addition, a plurality of axially extending slots 60 are formed in the end 54 so as to define resilient fingers 62 therebetween. The opposite end 56 is provided with a central bore 64 that is arranged to receive the stripped end 66 of the cable 34.

After the cable 34 is secured to the lug 56 and the lug 56 is inserted within the bore 44 of the contact 36, a screw 68 is inserted through the end 42 and through the opening 40 formed in the central portion 38. The screw 68 mates with the threads in the tapped hole 58. With the screw 68 so positioned, the fingers 60 will be formed generally radially outward into intimate contact with the inside diameter of the bore 44 formed in the contact 36 and thereby provides improved electrical contact between the lug 50 and the contact 36.

In the assembled condition, as shown in FIG. 2, it will be seen that a sleeve 70 is positioned within the bore 32 and surrounds at least the slotted portion of the contact 36. A coiled spring 72 is wound around the slotted portion of the contact 36 and is positioned intermediate the outside diameter of the contact 36 and the inside diameter of the sleeve 72. The spring 72 serves to urge the fingers 48 of the contact 36 in a radially inward direction and thereby resists or acts against the male contact (not shown) when the male contact is inserted.

Finally there is provided a plastic bushing 80 that serves to accurately locate the fingers 48 of the contact 36. The bushing 80 is provided with an enlarged diameter end portion 82 in which is formed a central opening 84. A reduced diameter end portion 86 is formed on the enlarged portion 82 in order to define a transverse wall 88 therebetween. In the assembled condition, the free end of the fingers 48 abut the wall 88 and the sleeve 70 is positioned about the smaller diameter end 86 in abutment with the enlarged diameter portion 82

as shown in FIG. 2. It should be noted that the opening 84 is substantially the same size as the opening 90 formed in the housing 12 so that the male contact 10 may be passed therethrough. Thus, the fingers 48 cannot move radially outward beyond the inside diameter 86 of the bushing 80.

There has been disclosed heretofore the best embodiment of the invention presently contemplated. However, it is to be understood that various changes and modifications may be made thereto without departing from the spirit of the invention.

What I claim as new and desire to secure by Letters Patent is:

1. An improved connector comprising, in combination:

- a. a substantially solid insulator body portion having a plurality of bores molded therein;
- b. conductive contact means positioned in said bores, said contact means including a slotted first end having a bore therein, said bore being adapted to receive a mating connector contact means and a second, axially spaced apart tubular end having a bore therein that is substantially circular in transverse cross section;
- c. a conductive lug having a first end positioned within said second end of said contact means, said lug having a second end adapted to receive a bare end of a length of conductor;
- d. means for securing said first end of said lug within said second end of said contact means;
- e. a sleeve positioned about at least said slotted end of said contact means, said sleeve being radially spaced from said contact means for defining an annular space, said sleeve further including a radially directed portion in abutment with said contact means;
- f. a compression spring coiled about said contact means within said annular space; and
- g. insulator bushing means positioned about said slotted first end of at least some of said contact means, the body portion of said bushing means being captured in said annular space, with said sleeve being positioned about the outside surface of said bushing means body portion.

2. The connector in accordance with claim 1, wherein said contact means includes a transverse wall intermediate said first and second ends thereof and a bore through said wall, said securing means comprising a headed screw, the threaded shank of which is sized to pass through said bore in said wall, and internal threads formed in said slotted first end of said contact means for receiving said screw threads.

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